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Light propagation in scanning nearfield optical microscopy probe

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Abstract

Katzenellenbaum method of cross sections is developed to the calculation of the light field parameters in nearfield microscopy probe. The dynamics of the modes propagation in the narrowing probe is studied when the probe aperture size is less than the wavelength λ of light. The analytical expressions for the modes wave numbers in the taper probe have been obtained, which essentially facilitate the analysis of the field parameters in the probe and allow to save the computing time considerably. The influence of walls inclination corner of the probe on modes amplitudes behavior is determined for the excitation of the probe by the monochromatic light. We demonstrate that the variation of the wall inclination corner can result to essential changing of the spatial field structure in the output probe aperture. Using the cross sections method we have studied the propagation and decreasing of the femtosecond pulse of light with 50 fs pulse duration in the taper probe.

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Keywords

Nearfield optics, Probe, Propagation of the femtosecond fields, Scanning nearfield optical microscopy